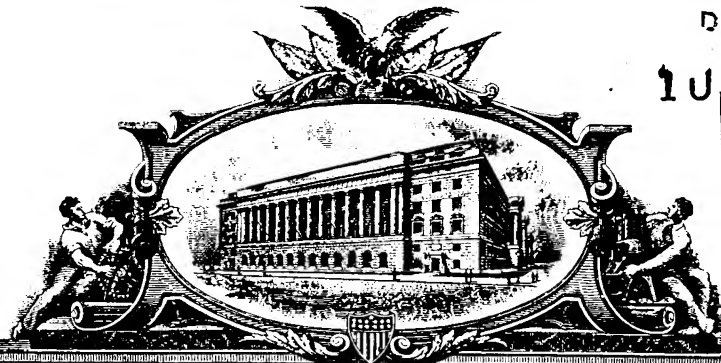


PCT/EP 00/06612
10/030567 #2

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APPLICATION NUMBER: 60/142,827

FILING DATE: July 08, 1999

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PROVISIONAL APPLICATION COVER SHEET

1c520 U.S. PTO
07/08/99

1c541 U.S. PTO
07/14/99

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53 (b)(2).

Docket Number		P99,1419		Type a plus sign (+) inside this box →		+	
INVENTOR(s)/APPLICANT(s)							
LAST NAME		FIRST NAME		MIDDLE INITIAL		RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY)	
Farnsworth - Boatman		John - Jack		T. K.		St. Joseph, Missouri St. Joseph, Missouri	
TITLE OF THE INVENTION (200 characters max)							
EXTRUSION DIE PLATE AND CUTTER ASSEMBLY WITH HYDRAULIC MOTOR							
CORRESPONDENCE ADDRESS							
HILL & SIMPSON 233 South Wacker Drive, 85th Floor Sears Tower Chicago							
STATE		Illinois		ZIP CODE		60606	
				COUNTRY		USA	
ENCLOSED APPLICATION PARTS (check all that apply)							
<input checked="" type="checkbox"/> Specification		Number of Pages: 10		<input type="checkbox"/> Small Entity Statement			
<input checked="" type="checkbox"/> Drawing(s)		Number of Sheets: 4		<input type="checkbox"/> Other (specify):			
METHOD OF PAYMENT (check one)							
<input checked="" type="checkbox"/> A check or money order is enclosed to cover the Provisional filing fees.						PROVISIONAL FILING FEE AMOUNT(S)	
<input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge filing fees and credit Deposit Account Number: 08-2290							
						\$150.00	

This invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are _____

Respectfully submitted,

SIGNATURE

Date

7-8-99

TYPED or PRINTED NAME ROBERT M. BARRETT

REGISTRATION NO. (if appropriate) 30,142

☐ Additional inventors are being named on separately numbered sheets attached here to

PROVISIONAL APPLICATION FILING ONLY

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EXTRUSION DIE PLATE AND CUTTER ASSEMBLY WITH HYDRAULIC MOTOR

FIELD OF THE INVENTION

5 This invention relates to extrusion apparatus which includes a die plate through which extrudate is received and shaped, the extrudate being severed into discrete pieces as it emerges from the die plate by a cutter assembly having a blade that is rotated into the path of movement of the extrudate.

BACKGROUND OF THE INVENTION

10 The cutter assembly for cutting extrudate has, in the past, been associated with an electrically-driven motor. The cutter assembly will rotate about a fixed shaft mounted to the extruder and the coupling to a motor for rotation may be via a spool attached to a belt driven by the motor, as in US 5,641,529, or via a universal
15 drive connection that is itself coupled to another drive. Such assemblies are cumbersome because of the space occupied by the electric motor, the associated coupling means, and the framework necessary to support the motor unit.

20 An object of this invention is to provide means for rotating a cutter blade that may be integrated into the cutter assembly to thereby save space and facilitate maintenance of the extrusion apparatus.

SUMMARY OF THE INVENTION

25 In accordance with this invention, a die plate for an extruder is modified to be coupled directly to a fluid-driven motor on one side and to an extruder on the other side. Suitable fluid inlet and outlet passages are formed in the die plate to

supply the motor with fluid and withdraw fluid. The cutter assembly includes a housing which receives the motor within and is coupled for rotation to an output shaft from the motor.

5 BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention is described below with reference to the accompanying drawings, in which:

Fig. 1 is a schematic perspective view showing an extruder coupled to an electrically-driven motor;

10 Fig. 2 is a similar view to Fig. 1 showing an extruder coupled to a hydraulic motor in accordance with the invention;

Fig. 3 is an exploded perspective view showing a housing for the cutter assembly of Fig. 2 spaced from the hydraulic motor;

Fig. 4 is an enlarged view of circled area 4 in Fig. 3;

15 Fig. 5 is a front plan view of a die plate comprising the invention;

Fig. 6 is a side elevation view of the die plate of Fig. 5; and

Fig. 7 is a back plan view of the die plate of Fig. 5.

DESCRIPTION OF PREFERRED EMBODIMENT

20 An extruder generally indicated by reference numeral 20 in Fig. 1 comprises a longitudinally-extending housing which is coupled at one end to a die plate 22. The die plate 22 has a plurality of die openings 24 through which extrudate is received during operation of the extruder 20. A cutter assembly 26 is rotatably mounted to a shaft (not shown) and includes a plurality of radially-extending blades

28 which, when rotated, sever the extrudate into discrete pieces 30. An electrically-driven motor 32 with axially-extending driveshaft 34 is coupled to the cutter assembly 26 via a universal drive connection 36 mounted to one end of the cutter assembly 26 remote from the extruder 20. It will be understood that the motor 32 must be supported, for example, with an associated framework, in order to operate the cutter assembly without becoming unbalanced.

In accordance with the invention, the installation and operation of the extrusion apparatus is simplified considerably by integrating a hydraulically-driven motor into the cutter assembly. In Fig. 2 of the drawings, there is shown a conventional extruder 40 which includes a longitudinally-extending housing and is coupled at one end to a die plate 42 made in accordance with the invention. The die plate 42 has a plurality of die openings 44 for receiving extrudate from the extruder 40, in accordance with normal practice. A cutter assembly 46 is associated with the die plate 42 and includes a plurality of radially-extending blades 48 for cutting the extrudate into discrete pieces 50.

As can be seen more clearly from Fig 3, the cutter assembly 46 includes a cylindrical housing 47 which houses a hydraulically-driven motor 52. The motor 52 is centrally mounted to the die plate 42 with mounting bolts 54 (only one of which is shown in Fig. 3). Alternatively, the motor 52 could be located eccentrically with respect to the die plate 42. A hydraulic fluid inlet passage 56 in fluid communication with a hydraulic fluid supply hose 58 is formed in the die plate 42 and is in fluid communication with the hydraulic motor 52. A hydraulic outlet passage 60 is also formed in the die plate 42 and is in fluid communication with a hydraulic fluid outlet hose 62 so as to withdraw hydraulic fluid from the hydraulic

motor 52.

5 The hydraulic motor 52 has an output shaft 64 which extends longitudinally from the extruder 40 and has a longitudinally-extending key way 66. The output shaft 64 is received through an opening 68 formed in a boss 70 which extends longitudinally from the housing 47 for the cutter assembly 46 at one end, opposite from the extruder 40. A second key way 72 is formed in the opening 68 and slidably receives a key 74. The key 74 is located between key ways 66, 72 and set screw 76 received through an aperture 78 formed in the boss 70 bears upon the key 74 to prevent longitudinal displacement of the key. This arrangement secures the cutter assembly 46 to the output shaft 64 of the hydraulic motor 52 so that, upon actuation of the motor, the blades 48 will rotate to sever the extrudate. It will be understood that there is a pre-determined separation between the cutter blades 48 and the outer surface of the die plate 42.

10 The die plate 42 is shown in more detail in Figs. 4 through 6. As will be common in the art, the die plate 42 has coupling means for coupling the die plate on an inner side thereof to the extruder 40 and these comprise a series of counter-sunk openings 80 equally spaced around the periphery of the die plate 42 through which mounting bolts 82 (Fig. 3) are received and threaded into cooperating threaded apertures (not shown) provided on the extruder 40.

15 20 The die plate 42 includes an inner ring 84 which has a series of equally-spaced openings 86 which define respective die nozzles through which extrudate is received and extruded. In a central area 88 of the die plate 42, three counter-sunk openings 90 are formed to receive the mounting bolts 84 that secure the die plate 42 to the hydraulic motor 52 (Fig. 3). It will be noted that counter-sunk openings 80 and 90

are oppositely directed in order to allow the die plate to be coupled to the extruder 40 and to the hydraulic motor 52 on respective sides thereof.

Both the hydraulic inlet passage 56 and hydraulic outlet passage 60 (only one of which is shown in ghost outline in the side elevation view of Fig. 5) comprise a radial portion which extends radially from a peripheral edge 92 for the die plate 42 towards the central area 88 where the passages terminate in respective longitudinally-extending portions that terminate on the front side of the die plate 42 so as to communicate with respective passages provided in the hydraulic motor 52. Respective O-ring seals 94, 96 are seated in the openings defining the hydraulic inlet passage and outlet passage 56, 60.

By integrating the hydraulic motor into the cutter assembly, the extruder installation is considerably simplified with attendant advantages in minimizing space required for installation and ease of maintenance.

It will be appreciated that several variations may be made to the above-described preferred embodiment of the invention within the scope of the appended claims. In particular, it will be noted that, while a hydraulic motor has been described, any fluid-driven motor may be accommodated into the above-described arrangement and could, for example, comprise a pneumatically-driven motor. It will also be appreciated that the key way coupling of the output shaft from the hydraulic motor to the cutter assembly may be modified, as required, as will be appreciated by anyone skilled in this art.

Finally, it will also be immediately apparent that the manner of mounting the cutter blades to the cutter assembly may be modified, as required, to suit the intended application and that a single cutting plate may be substituted for a plurality

10

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378</
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WE CLAIM

1. Die plate for extrusion apparatus, the die plate having:

first coupling means for coupling the die plate on a first side thereof to an
5 extruder defining a longitudinal axis,

second coupling means for coupling the die plate on a second side thereof to
a cutter assembly disposed on said longitudinal axis,

apertures through which extrudate is received from the extruder and extruded
for cutting into predetermined lengths by said cutter assembly,

10 a fluid inlet passage for receiving fluid into the die plate for delivery to said
cutter assembly, and

a fluid outlet passage for receiving fluid from said cutter assembly for
discharge from the die plate, the cutter assembly having a fluid driven motor for
rotating a cutter transversely to said longitudinal axis into the path of movement of
15 extrudate so as to sever the extrudate.

2. Die plate according to Claim 1 having a peripheral edge adjoining said first
and second sides, said first and second coupling means comprising a plurality of
mounting apertures for receiving respective fasteners through the die plate, the fluid
20 inlet passage and fluid outlet passage each having a radial portion extending radially
through said peripheral edge toward a central area of the die plate where each
passage terminates in a respective longitudinal portion extending through said second
side of the die plate.

3. A die plate and cutter assembly, the die plate having first coupling means for coupling the die plate on a first side thereof to an extruder, defining a longitudinal axis,

second coupling means for coupling the die plate on a second side thereof to
5 a cutter assembly disposed on said longitudinal axis,

apertures through which extrudate is received from the extruder and extruded for cutting into predetermined lengths by said cutter assembly,

a fluid inlet passage for receiving fluid into the die plate for delivery to said cutter assembly, and

10 a fluid outlet passage for receiving fluid from said cutter assembly for discharge from the die plate,

the cutter assembly having a hydraulic motor coupled to said second side of the die plate and adapted to receive hydraulic fluid from said fluid inlet passage and to discharge hydraulic fluid into said fluid outlet passage, and

15 a rotatable cutter driven for rotation transversely to said longitudinal axis by said hydraulic motor, into the path of movement of extrudate so as to sever the extrudate.

4. Assembly according to Claim 3 in which the rotatable cutter includes a
20 housing coupled for rotation to said hydraulic motor, the motor being received within said housing, and the housing having blade mounting means for supporting at least one radially extending blade having a predetermined separation from said second side of the die plate and adapted to sever extrudate.

5. A die plate and cutter assembly, the die plate having first coupling means for coupling the die plate on a first side thereof to an extruder, defining a longitudinal axis,

second coupling means for coupling the die plate on a second side thereof to
5 a cutter assembly disposed on said longitudinal axis,

apertures through which extrudate is received from the extruder and extruded for cutting into predetermined lengths by said cutter assembly,

a fluid inlet passage for receiving fluid into the die plate for delivery to said cutter assembly, and

10 a fluid outlet passage for receiving fluid from said cutter assembly for discharge from the die plate,

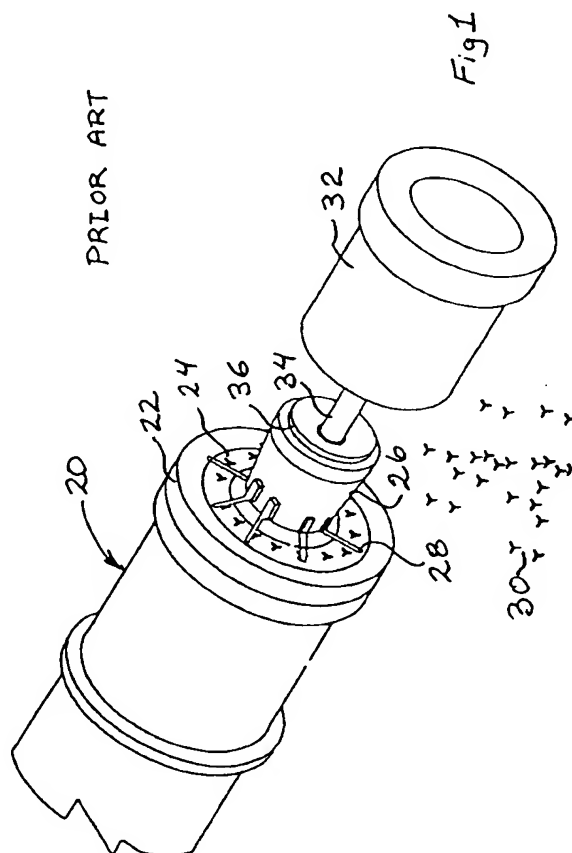
the cutter assembly having a hydraulic motor coupled to said second side of the die plate and adapted to receive hydraulic fluid from said fluid inlet passage and to discharge hydraulic fluid into said fluid outlet passage,

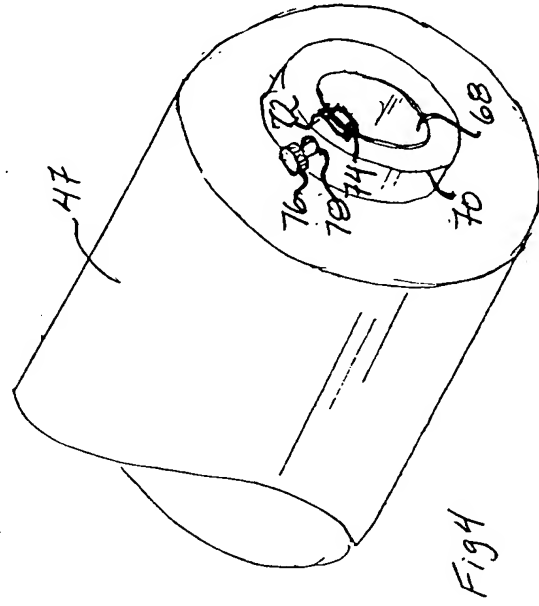
15 a housing coupled for rotation to said hydraulic motor, the motor being received within said housing, and

at least one radially extending blade mounted to said housing and having a predetermined separation from said second side of the die plate, said at least one blade being driven for rotation transversely to said longitudinal axis by said
20 hydraulic motor, into the path of movement of extrudate so as to sever the extrudate.

ABSTRACT OF THE DISCLOSURE

A die plate for an extruder is coupled directly to a fluid-driven motor on one side and to an extruder on the other side. Suitable fluid inlet and outlet passages are formed in the die plate to supply the motor with fluid and withdraw fluid. The
5 cutter assembly includes a housing which receives the motor within and is coupled for rotation to an output shaft from the motor.





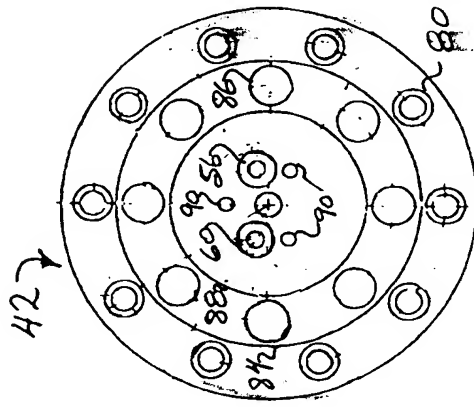


Fig 5

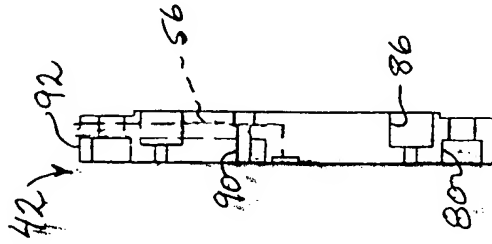


Fig 6

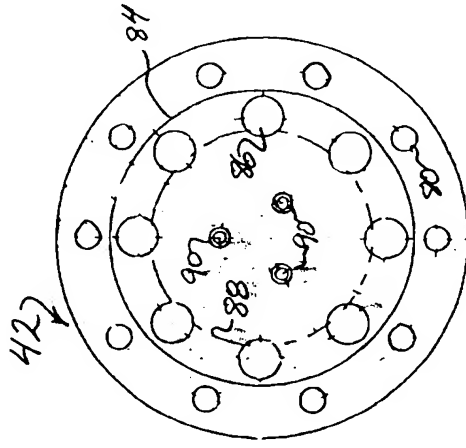


Fig 7